MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

BEF3014 – ECONOMETRIC MODELLING & FORECASTING

(All sections / Groups)

6 MARCH 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** questions in **FOUR (4)** printed pages.
2. Answer **ALL** questions in the answer booklet provided.
3. Marks are shown at the end of each question.
4. The formula sheet is found at the last page of this exam paper.

Question 1

Harry the Coco Bun Company would like to forecast how its retail and food sales will fare over the coming months. The model is presented as follow:

$$SALES_t = \beta_0 + \beta_1 CS_t + \beta_2 IP_t + \beta_3 INC_t + \beta_4 CPI_t + \beta_5 XMAS_t + \varepsilon_t$$

SALES	:	Retail and food service sales ($ million)
CS	:	Consumer sentiment index
IP	:	Industrial production index
INC	:	Personal income ($ per capita)
CPI	:	Consumer price index
XMAS	:	Dummy indicator for Christmas (December = 1, Otherwise = 0)

The results are presented in **Table 1**.

TABLE 1

Estimated sample period: January 2000 – November 2008
Total observation: 107

Variable	Coefficient	Standard error	t-statistics	Probability
Constant	0.617	0.771	0.801	0.425
CS	0.224	0.061	3.662	0.000
IP	0.490	0.288	1.701	0.092
INC	-1.352	0.397	-3.405	0.001
CPI	4.037	0.676	5.967	0.000
XMAS	0.192	0.018	10.601	0.000

R-squared = 0.888
F-statistic = 160.202 [0.000]
Jarque-Bera test = 5.254 [0.072]
Serial correlation LM test = 2.643 [0.076]
White test = 14.744 [0.324]

Correlation Matrix

	CS	*IP*	*INC*	*CPI*
CS	1	--	--	--
IP	-0.381	1	--	--
INC	-0.664	0.881	1	--
CPI	-0.721	0.845	0.992	1

Based on **Table 1**, answer the following questions:

(a) Perform *t*-test for each independent variable using *p*-value at 5% significance level. (10 marks)

(b) Interpret the coefficient for *XMAS*. (2 marks)

Continued...

(c) Interpret the coefficient of determination. (2 marks)

(d) Is the multiple regression model free from econometric problems? Explain. (6 marks)

(e) Forecast the retail and food service sales for the company in December 2008, given the values for *CS*, *IP*, *INC* and *CPI* are 4.096, 4.637, 9.400 and 5.348 respectively. (2 marks)

(f) Generate a 95% prediction interval for the sales in December 2008 based on part (e), given the estimated standard error is 0.0556. (3 marks)

[Total marks: 25 marks]

Question 2

Table 2 presents the data of Malaysian population growth from 2009 to 2015.

Table 2

Year	Population growth (annual %)
2009	1.7
2010	1.6
2011	1.6
2012	1.6
2013	1.5
2014	1.5
2015	1.4

Source: Data are obtained from World Bank, www.databank.worldbank.org

(a) Based on **Table 2**, forecast the population growth from 2013 to 2015 using:

(i) Moving average of 3, MA(3). (6 marks)

(ii) Moving average of 4, MA(4). (6 marks)

(iii) Simple exponential smoothing with $\alpha = 0.6$. (6 marks)

(b) Compute RMSE for each forecasting method in part (a). (3 marks)

(c) Based on part (b), recommend the forecasting method that performs best. Explain. (4 marks)

[Total marks: 25 marks]

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Question 3

(a) Layout the major **FOUR (4)** steps in the Box-Jenkins (BJ) Methodology. (10 marks)

(b) The following is the estimated generalized autoregressive conditional heteroscedasticity, GARCH (1,1) model for the daily data of U.S. stock price index, FTSE100.

$$\hat{\sigma}_t^2 = 0.029 + 0.075\mu_{t-1}^2 + 0.895\sigma_{t-1}^2$$
$$z\text{-stat} \qquad (4.547) \quad (36.955)$$

Based on the estimated model, answer the following questions:

(i) Interpret the coefficient of μ_{t-1}^2 and σ_{t-1}^2. (5 marks)

(ii) Generate a 95% prediction interval for the volatility of FTSE100, assume that $\mu_{t-1}^2 = 0.65$, $\sigma_{t-1}^2 = 0.83$, and estimated standard error = 0.979. (4 marks)

(iii) If the actual volatility of FTSE100 is 2.87, does it surprise you? Explain. (2 marks)

(iv) Is it appropriate to adopt GARCH (1,1) to estimate the U.S. stock price index FTSE100? Explain. (4 marks)

[Total marks: 25 marks]

Question 4

(a) List **THREE (3)** problems in time series forecasting. (3 marks)

(b) Describe any **TWO (2)** forecasting methods each for:

(i) Univariate analysis (6 marks)

(ii) Multivariate analysis (6 marks)

(c) Briefly discuss the importance of forecasting using PHIVE. (10 marks)

[Total marks: 25 marks]

End of Questions

Formula Sheet

$$MA(t \mid K) = \frac{Y_n + Y_{n-1} + \ldots + Y_{n-K+1}}{K}$$

Mean Square Error (MSE) $= \frac{1}{n}\sum_{i=1}^{n}\left(Y_{t+i} - F_{t+i}\right)^2$

Root Mean Square Error (RMSE) $= \sqrt{MSE}$

Simple exponential smoothing (SES)

$F_{t+1} = F_t + \alpha\left(Y_t - F_t\right)$

Starting value: $F_{t+1} = Y_t$

Prediction interval = $F_{t+1} \pm t_{\frac{\alpha}{2}}\left(n-K-1\right) * SE\left(Y_{t+1} - F_{t+1}\right)$

Summary of *t*-distribution:

df \ Pr	**0.05 0.10**	**0.025 0.05**	**0.005 0.010**
40	1.684	2.021	2.704
60	1.671	2.000	2.660
120	1.658	1.890	2.617
∞	1.645	1.960	2.576

End of Paper